

CLAIMS

1. A photocurable adhesive composition comprising based on  
5 the total weight of the photopolymerizable monomers and/or  
oligomers of the composition :

5 to 60 wt% of at least one mono or polyacrylate monomer or  
oligomer thereof (A) ;

10 5 to 50 wt% of at least one thio(meth)acrylate monomer or  
oligomer thereof (B) ; and

20 to 50 wt% of at least one aromatic dimethacrylate  
monomer or oligomer thereof (C) ;

With the proviso that the composition does not contain a  
brominated monofunctional acrylate.

15 2. The photocurable adhesive composition of claim 1  
comprising :

- at least 15 wt% of (A) ;
- at least 9 wt% of (B) ; and
- at least 25 wt% of (C).

20 3. The photocurable adhesive composition of claim 1  
comprising :

20 to 60 wt% at least one mono or polyacrylate monomer or  
oligomer thereof (A) ;

25 20 to 50 wt% of at least one thio(meth)acrylate monomer or  
oligomer thereof (B) ; and

20 to 40 wt% based on the total weight of the  
photopolymerizable composition of at least one aromatic  
dimethacrylate monomer or oligomer thereof (C).

30 4. The photocurable adhesive composition of claim 1,  
comprising 20 to 60 wt% of (A), 30 to 50 wt% of (B) and 20 to 40  
wt% of (C).

5. The photocurable adhesive composition of claim 1  
comprising :

35 20 to 50 wt% of at least one mono or polyacrylate monomer  
or oligomer thereof (A) ;

30 to 50 wt% of at least one thio(meth)acrylate monomer or  
oligomer thereof (B) ; and

20 to 40 wt% of at least one aromatic dimethacrylate monomer or oligomer thereof (C).

6. The photocurable adhesive composition of claim 1 comprising :

5 20 to 40 wt% of at least one mono or polyacrylate monomer or oligomer thereof (A) ;

35 to 45 wt% of at least one thio(meth)acrylate monomer or oligomer thereof (B) ; and

10 25 to 35 wt% of at least one aromatic dimethacrylate monomer or oligomer thereof (C).

7. The photocurable adhesive composition according to anyone of claims 1 to 5, wherein said at least one mono or polyacrylate monomer (A) has a calculated solubility parameter, ranging from 8 to 12 (cal/cm<sup>3</sup>)<sup>1/2</sup>.

15 8. The photocurable adhesive composition of claim 7, wherein said at least one mono or polyacrylate monomer (A) has a calculated solubility parameter ranging from 8.5 to 11.5 (cal/cm<sup>3</sup>)<sup>1/2</sup>.

9. The photocurable adhesive composition according to anyone of the preceding claims, wherein said at least one mono or polyacrylate monomer (A) has a molecular weight < 500.

20 10. The photocurable adhesive composition of claim 9, wherein said at least one mono or polyacrylate monomer (A) has a molecular weight ≤ 350.

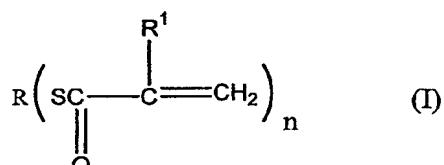
25 11. The photocurable adhesive composition according to anyone of the preceding claims, wherein said at least one monomer (A) is a low refractive index monomer.

12. The photocurable adhesive composition according to anyone of the preceding claims, wherein said mono or polyacrylate monomer (A) is a non-aromatic mono or polyacrylate monomer.

30 13. The photocurable adhesive composition of claim 12, wherein monomer (A) is selected from diethyleneglycol diacrylate, triethyleneglycol diacrylate, tetraethyleneglycol diacrylate, neopentylglycoldiacrylate, 1,6-hexanediol diacrylate and tetrahydrofurfuryl acrylate.

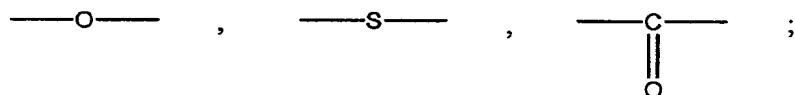
35 14. The photocurable adhesive composition according to anyone of the preceding claims, wherein the at least one thio(meth)acrylate monomer (B) is a high refractive index monomer.

15. The photocurable adhesive composition according to anyone of the preceding claims, wherein the at least one thio(meth)acrylate monomer (B) is a monomer of formula :



5

10 wherein R is a linear or branched, monovalent or polyvalent, aliphatic hydrocarbon radical, or a monovalent or polyvalent aromatic group directly linked to the sulfur atom of the thio(meth)acrylate group(s) through an aromatic ring or by means of a linear alkyl chain, the radical R may include in its chain one or  
15 more of :



R<sup>1</sup> is H or -CH<sub>3</sub> ; and

20 n is an integer from 1 to 6.

16. The photocurable adhesive composition according to anyone of the preceding claims, wherein the at least one aromatic dimethacrylate monomer (C) is an ethoxylated bisphenol-A monomer.

25 17. The photocurable adhesive composition according to anyone of the preceding claims, further comprising at least one photoinitiator.

18. The photocurable adhesive composition of claim 17, wherein the photoinitiator represents 0,1 to 5 parts by weight for  
30 100 parts by weight of the polymerizable monomers and/or oligomers.

19. The photocurable adhesive composition according to anyone of the preceding claims, wherein, after curing, the adhesive composition has a refractive index of 1.53 to 1.65.

20. A process for transferring a coating from a support onto a surface of a thermoplastic material substrate comprising :

- providing a thermoplastic material substrate having at least one main surface ;
- providing a support having an internal surface bearing a coating and an external surface ;
- 10 depositing on the main surface of the substrate or on the coating a pre-measured amount of a curable adhesive composition comprising, based on total weight of photopolymerizable monomer and/or oligomers of the composition :
  - 15 5 to 60 wt% of at least one mono or polyacrylate monomer or oligomer thereof, (A) ;
  - 5 to 50 wt% of at least one thio(meth)acrylate monomer or oligomer thereof, (B) ; and
  - 20 to 50 wt% of at least one aromatic dimethacrylate monomer or oligomer thereof, (C) ;
- 20 with the proviso that the composition does not contain a brominated monofunctional acrylate ;
- 25 moving relatively to each other the substrate and the support to either bring the coating into contact with the curable adhesive composition or bring the curable adhesive composition into contact with the main surface of the substrate;
- 30 applying a sufficient pressure onto the external surface of the support so that the thickness of a final adhesive layer, once the curable adhesive composition has cured is less than 100  $\mu\text{m}$  ;
- curing the layer of adhesive composition; and
- withdrawing the support to recover a substrate with the coating adhered onto its main surface.

35 21. The process of claim 20, wherein the photocurable adhesive composition comprises :

- at least 15 wt% of (A) ;
- at least 9 wt% of (B) ; and
- at least 25 wt% of (C).

22. The process of claim 20, wherein the photocurable adhesive composition comprises :

- 20 to 60 wt% at least one mono or polyacrylate monomer or oligomer thereof (A) ;
- 20 to 50 wt% of at least one thio(meth)acrylate monomer or oligomer thereof (B) ; and
- 10 20 to 40 wt% based on the total weight of the photopolymerizable composition of at least one aromatic dimethacrylate monomer or oligomer thereof (C).

23. The process of claim 20, wherein the photocurable adhesive composition comprises 20 to 60 wt% of (A), 30 to 15 50 wt% of (B) and 20 to 40 wt% of (C).

24. The process of claim 20, wherein the photocurable adhesive composition comprises :

- 20 to 50 wt% of at least one mono or polyacrylate monomer or oligomer thereof (A) ;
- 20 30 to 50 wt% of at least one thio(meth)acrylate monomer or oligomer thereof (B) ; and
- 20 to 40 wt% of at least one aromatic dimethacrylate monomer or oligomer thereof (C).

25. The process of claim 20, wherein the photocurable adhesive composition comprises :

- 20 to 40 wt% of at least one mono or polyacrylate monomer or oligomer thereof (A) ;
- 35 to 45 wt% of at least one thio(meth)acrylate monomer or oligomer thereof (B) ; and
- 30 25 to 35 wt% of at least one aromatic dimethacrylate monomer or oligomer thereof (C).

26. The process according to anyone of claims 20 to 25, wherein the thermoplastic material of the substrate is a high refractive index material.

35 27. The process according to anyone of claims 20 to

26, wherein the thermoplastic material of the substrate is polycarbonate.

28. The process according to anyone of claims 20 to 27, wherein said at least one mono or polyacrylate monomer (A) has a calculated solubility parameters ranging from 8 to 12 (cal/cm<sup>3</sup>)<sup>1/2</sup>.

29. The process of claim 28, wherein said at least one mono or polyacrylate monomer (A) has a calculated solubility parameter ranging from 8.5 to 11.5 (cal/cm<sup>3</sup>)<sup>1/2</sup>.

30. The process according to anyone of claims 20 to 29, wherein said at least one mono or polyacrylate monomer (A) has a molecular weight < 500.

31. The process of claim 30, wherein said at least one monomer (A) has a molecular weight ≤ 350.

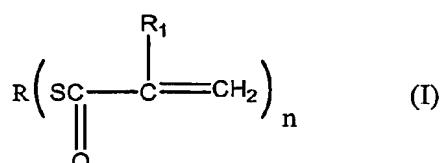
32. The process according to anyone of claims 20 to 31, wherein said at least one monomer (A) is a low refractive index monomer.

33. The process according to anyone of claims 20 to 32, wherein said mono or polyacrylate monomer (A) is a non-aromatic mono or polyacrylate monomer.

34. The process of claim 33, wherein monomer (A) is diethyleneglycol diacrylate, triethyleneglycol diacrylate, tetraethyleneglycol diacrylate, neopentylglycoldiacrylate, 1,6-hexanediol diacrylate and tetrahydrofurfuryl acrylate.

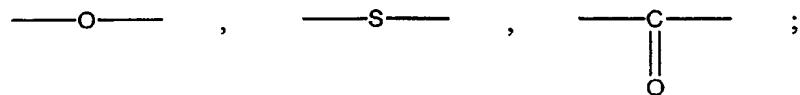
35. The process according to anyone of claims 20 to 34, wherein the said at least one thio(meth)acrylate monomer (B) is a high refractive index monomer.

36. The process according to anyone of claims 20 to 35, wherein the at least one thio(meth)acrylate monomer (B) is selected from monomers of formula :



wherein R is a linear or branched, monovalent or polyvalent, aliphatic hydrocarbon radical, or a monovalent or polyvalent aromatic group directly linked to the sulfur atom of the

thio(meth)acrylate group(s) through an aromatic ring or by means of a linear alkyl chain, the radical R may include in its chain one or more of :



$R^1$  is H or  $-CH_3$ ; and

*n* is an integer from 1 to 6, preferably from 1 to 3.

37. The process of claim 36, wherein n is an integer from 1 to

38. The process according to anyone of claims 20 to 37, wherein the at least one aromatic dimethacrylate monomer (C) is selected from ethoxylated bisphenol-A monomers.

39. The process according to anyone of claims 20 to 38, wherein the photopolymerizable adhesive composition further comprises at least one photoinitiator.

40. The process of claim 39, wherein the photoinitiator represents 0,1 to 5 parts by weight for 100 parts by weight of the photopolymerizable monomers.

41. The process according to anyone of claims 20 to 40, wherein the substrate is a lens blank, and the main surface is a geometrically defined surface of the lens blank.

42. The process of claim 41, wherein the support is a flexible support part having an internal surface conformable to a geometrically defined surface of the lens blank when brought into contact therewith.

43. The process of claim 41 or 42, wherein the support is made of polycarbonate.

44. The process according to anyone of claims 20 to 43, wherein the support has a thickness of 0.3 to 1 mm.

45. The process according to anyone of claims 20 to 44, wherein the thickness of the final cured adhesive layer is less than 80  $\mu\text{m}$ .

46. The process according to anyone of claims 20 to 44, wherein the thickness of the final cured adhesive layer is less than 50  $\mu\text{m}$ .

47. The process according to anyone of claims 20 to 46, wherein the final cured adhesive layer has a refractive index of 1.53 to 1.65.

48. The process according to anyone of claims 20 to 47, wherein the exerted pressure ranges from 5 to 50 Psi (0.35 to 3.5 kgf/cm<sup>3</sup>).

49. The process according to anyone of claims 20 to 48, wherein the coating comprises a hydrophobic top coat, an anti-reflective coating layer, an anti-abrasion coating layer, an impact resistant coating layer, a photochromic coating layer, a dyeing coating layer a polarized coating layer, a printed layer or a stack of two or more of these coating layers.

50. The process of claim 49, wherein the coating has a thickness of 50  $\mu\text{m}$  or less.

51. The process according to anyone of claims 20 to 50, wherein the substrate is a semi-finished lens having one face already provided with a coating.

52. The process of claim 51, wherein the face already provided with a coating is the front face of the lens and the geometrically defined surface onto which the coating is transferred is the back surface of the lens.

53. The process of claim 42, wherein the flexible support is urged against the lens blank by means of an inflatable membrane.

54. An overmolding process which comprises :

- providing a thermoplastic material substrate having at least one main surface ;
- providing a mold part having an internal surface and an external surface ;
- depositing on the main surface of the substrate or on the internal surface of the mold part a pre-measured amount of a curable adhesive composition comprising, based on

the total weight of photopolymerizable monomers and/or oligomers of the composition :

5 to 60 wt% of at least one mono or polyacrylate monomer or oligomer thereof (A) ;

5 to 50 wt% of at least one mono or polyacrylate monomer or oligomer thereof (B) ; and

20 to 50 wt% of at least one mono or polyacrylate monomer or oligomer thereof (C) ;

with the proviso that the composition does not contain a brominated monofunctional acrylate ;

- moving relatively to each other the substrate and the mold part to either bring the internal surface of the mold part or the main surface of the substrate in contact with the curable adhesive composition ;
- applying a sufficient pressure onto the external surface of the mold part to uniformly spread the curable adhesive composition and form a uniform layer, which, when cured, has a thickness of at least 200  $\mu\text{m}$ .
- curing the layer of adhesive composition ; and
- withdrawing the mold parts to recover the substrate overmolded with a cured layer of the curable adhesive composition.

55. The overmolding process of claim 54, wherein the photocurable adhesive composition comprises :

- at least 15 wt% of (A) ;
- at least 9 wt% of (B) ; and
- at least 25 wt% of (C).

56. The overmolding process of claim 54, wherein the photocurable adhesive composition comprises :

20 to 60 wt% at least one mono or polyacrylate monomer or oligomer thereof (A) ;

20 to 50 wt% of at least one thio(meth)acrylate monomer or oligomer thereof (B) ; and

20 to 40 wt% based on the total weight of the photopolymerizable composition of at least one aromatic dimethacrylate monomer or oligomer thereof (C).

57. The overmolding process of claim 56, wherein the photocurable adhesive composition comprises 20 to 60 wt% of (A), 30 to 50 wt% of (B) and 20 to 40 wt% of (C).

58. The overmolding process of claim 54, wherein the photocurable adhesive composition comprises :

20 to 50 wt% of at least one mono or polyacrylate monomer or oligomer thereof (A) ;

30 to 50 wt% of at least one thio(meth)acrylate monomer or oligomer thereof (B) ; and

20 to 40 wt% of at least one aromatic dimethacrylate monomer or oligomer thereof (C).

59. The overmolding process of claim 54, wherein the photocurable adhesive composition comprises :

20 to 40 wt% of at least one mono or polyacrylate monomer or oligomer thereof (A) ;

35 to 45 wt% of at least one thio(meth)acrylate monomer or oligomer thereof (B) ; and

25 to 35 wt% of at least one aromatic dimethacrylate monomer or oligomer thereof (C).

60. The overmodling process according to anyone of claims 54 to 59, wherein a coating to be transferred is applied to the internal surface of the mold part before depositing the curable adhesive composition.

61. The overmolding process according to anyone of claims 54 to 60, wherein the overmolded cured layer of curable adhesive composition has a thickness of at least 500  $\mu\text{m}$

62. A process for making laminated thermoplastic articles comprising depositing a pre-measured amount of a photocurable adhesive composition on a main surface of a first part made of thermoplastic material ;

bringing into contact the deposited photocurable adhesive composition with a main surface of a second part made of thermoplastic material ;

pressing the first and second parts against each other to uniformly spread the curable adhesive composition to form a uniform thin layer ; and photocuring the thin layer to obtain a laminated article, wherein the photocurable adhesive composition comprises, based on total weight of photopolymerizable monomers and/or oligomers of the composition :

5 to 60 wt% of at least one mono or polyacrylate monomer or oligomer thereof (A) ;

5 to 50 wt% of at least one thio(meth)acrylate monomer or oligomer thereof (B) ; and

20 to 50 wt% of at least one aromatic dimethacrylate monomer or oligomer thereof (C) ;

with the proviso that the composition does not contain a brominated monofunctional acrylate.

63. The process of claim 62, wherein the article is an ophthalmic lens.